

ACS Repair

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Almost immediately after the anomaly in the Advanced Camera for Surveys (ACS) occurred on January 27, 2007, the *Hubble* project assembled a team to examine the options for repair. Over the course of the following month, the ACS repair team worked in concert with the anomaly review board to discover the nature of the fault and developed some basic strategies for restoring ACS functionality. At the end of February, a specific option was chosen for further study, and a system concept review was conducted on March 28, 2007. This summer, the team is preparing the repair concept for the next *Hubble* servicing mission, and awaiting final approval from NASA Headquarters for implementation.

It is truly remarkable that a repair concept was conceived and developed in so short a time—even while the details of the fault and the exact status of the instrument were still being investigated. This accomplishment was facilitated by the repair team's strategy to only pursue solutions that were reasonably independent of credible failure modes. In other words, the process concentrated on solutions that bypassed suspect subsystems and components.

The limited amount of time available for extravehicular activity (EVA) by astronauts has been another driver. While the failure(s) are likely confined to the ACS's low-voltage power supply (LVPS), a direct repair of that subsystem—removing the covers, replacing the failed unit, and restoring the covers—would require too much EVA time. Fortunately, there is another solution.

The selected repair concept replaces the CCD electronics box (CEB) in the ACS's Wide Field Channel (WFC). The replacement CEB will be powered by a replacement LVPS, one completely independent of the failed unit. The replacement CEB will communicate with the WFC CCD—as well as with the rest of the instrument for command and data—via the edge connectors in the original CEB. The replacement LVPS draws power from the ACS primary power connectors, accessed via a splitter cable installed by the astronauts.

While the highest priority is restoring the WFC, the ACS repair concept also provides a path for restoring the High Resolution Channel (HRC). In this scenario, the repaired LVPS would provide power to the original power bus, accessed at the WFC CEB. The HRC CEB is wired in parallel with this power bus, which means that, in principle at least, it could be powered up and operated with power from the new LVPS. There is some risk that the fault(s) in the LVPS shorted the power harnesses, which would defeat restoring the HRC. There is also a possibility of increased noise in the HRC when operated in this mode. These issues are currently being studied by ground testing.

In summer 2007, the ACS repair team is working hard—preparing for reviews, detailing designs, prototyping, and proving concepts—to understand the feasibility of restoring the ACS for science. This understanding will inform a later decision by NASA Headquarters on whether or not to approve the ACS repair for execution on SM4.

Ed Cheng is the principal investigator for ACS repair. 

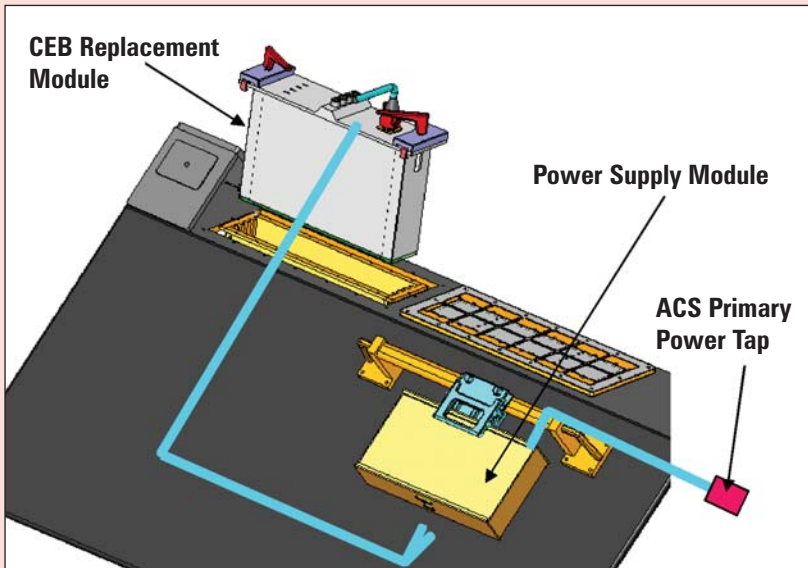


Figure 1: Mechanical layout of the ACS repair concept.